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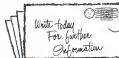


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The Navy Learns to Fly—

1911



In June of 1911, Lieut. John H. Towers (left) and Lieut. T. H. Ellyson (right) were ordered to demonstrate, in N. Y., to the Navy's first two air pilots, and subsequently both were to rise high in the ranks of the Navy's air service.

Our nation's aerial air arm has come a long way since the days when the young Lieutenants Towers and Ellyson learned to fly.

And through the years, these great advances in aeronautical engineering have been achieved by equally important developments in aviation fuels.

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The Navy's Air Cadet's first landing on an aircraft carrier was a great achievement. The pilot of a U.S. Navy Sea Cadet's first landing on a carrier was a great achievement.



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WHO'S WHERE

In the Front Office

J. L. Sisson has been elected president of Army Products, Inc., Fort Worth, Texas. Charles E. Roberts and Albert A. Rendon are new consultants to the president of Cooper Power Products, Los Angeles, who will assume responsibility of the company's operations. Dr. Roberts is in charge of design and engineering, Rendon takes over quality control, testing and production methods.

Changes

W. E. Thomas has been appointed administrative assistant to the vice president of operations of Northwest Airlines. R. C. Zee has been named assistant vice president of operations of Northwest Airlines.

James E. Mohr, former assistant to the president of Chase Aircraft Co., has joined Haver & Kuhn Co. as assistant to the vice president. H. Walter Kuhn is now coordinator of public relations for the Kuhn Company at Washington, D. C.

Cecil B. Tull, vice president of the company, is now general manager of the company's operations. Tull is now general manager of the company's operations. Tull is now general manager of the company's operations. Tull is now general manager of the company's operations.

Frank E. Chapman has become manager of technical relations and assembly at General Electric. W. D. Wirth has been named vice president of operations at General Electric. W. D. Wirth has been named vice president of operations at General Electric.

Frank J. Haddock has joined Seltzer Aircraft Co., San Diego, as assistant research engineer. Benjie B. McDaniel is now assistant general production superintendent. Col. James P. Foster has been named USAF plant representative at Boeing Aerospace Co.'s Wichita Div., according to Col. Foster. A. Hays, who has returned to active duty, is Col. James P. McDaniel is now chairman of the D-47 Development Committee.

Edward W. Wagoner has been appointed factory superintendent of Republic Aviation Corp., Farmingdale, N. Y. Ralph Roudsley is now assistant to the factory manager.

E. K. Wood has been appointed in chief of manufacturing development at the new application engineering dept. Col. J. P. Foster has become technical director manager of the Van Nuys, Calif., firm.

Hosiers and Elections

John W. Myers, not residing in North America, Inc., Hartford, Conn., has received the Night Fighter Award's first prize award for his outstanding work in the development of the company's operations.

Samuel R. Pryor, vice president of the American World Aircraft, has been elected to the executive committee of the American Helicopter Association.

INDUSTRY OBSERVER

► Republic Aviation has USAF production contracts for both its new super sonic fighter jets, the F-105 and F-106. The F-105 is a development of the XF-105 that features an extremely tapered wing and conventional turbojet engine power. The F-106 is a delta-wing design and will be built in both a fighter and reconnaissance version.

► Wright R3350-SD-1 engines on Chicago and Southern Air Lines L-649A Comets have been approved by CAA for 1,500 hr. between overhauls. This is a significant improvement over the 1,000 hr. between overhauls.

► Official USAF confirmation on production of a Russian tailoring B-16-type long-range strategic bomber was given by Air Force Secretary Donald Taylor at the Air Force Asia conference in Washington. Although none of these bombers appeared at the recent Red Air Force public display, Taylor and USAF is virtually certain they are in production.

► Air Force reports the Boeing XB-70 and YB-52 Stratofortress bombers prototypes have logged more than 700 hr. of flight test time and their performance has "surpassed expectations."

► General Electric's Hercules missile project has been sharply cut by the Army with a heavy reduction in personnel at the MIT, N. Y., rocket test station. Hercules was a relatively short-range surface-to-air missile.

► In the second and third test flights of the new Australian-built Silver Dagger, powered with a Rolls-Royce Avon engine, the airplane was able to fly faster than the speed of sound, and in one case was reported to have reached a speed of 900 mph, according to unofficial reports from Melbourne.

► Mustangs are placed with the program of their Lacrosse close support missile. It was added rocket propellant in mid-flight and then glides into the target. Lacrosse has a range of 3 to 10 miles.

► Saunders-Roe of England is interested in developing hydrofoil waterborne fighters similar to the Convair F2V-1, currently being built at San Diego for the Navy and Marines.

► Several major sub-contract contracts have been awarded by Convair, with USAF approval, on the XH-70 experimental bomber project, the first supersonic system to be handled under a single prime contract (Aerospace Week Aug. 17, p. 52). Aerodynamics and control systems went to Sanders Associates, and aerodynamics to Sperry and defense management system to General Electric. The four major contracts will be developed by General Electric under a major Air Force contract specifically exempt from Convair's single prime contract.

► Lee Atwood, president of North American Aviation, Inc., confirms earlier reports (Aerospace Week June 8, p. 19) that the XF-105 has been flying regularly at supersonic speeds in level flight. This is the first fighter in the world known to have exceeded Mach 1 regularly in level flight without the benefit of an initial climb. It is powered by a P6W-107 with afterburner producing about 15,000 lb. thrust. During the next 60 days of flight testing at Edwards AFB, the XF-105 made 16 flights.

► First triple results of Convair Aircraft Co. Helicopter Division's program, started after Convair bought Sikorski Helicopter Co. more than a year ago, has just begun through Wichita. It is a small helicopter suitable for agricultural or military utility tasks, but Convair is doing it as an independent business venture without military financing.

► Rohm and Haas has developed a new transparent plastic with improved heat resistance and crushing resistance characteristics, designated as Polymer K and used in making lighter heat exchangers at the facilities designed in high-speed flight.

B-36 Teams With F-84 to Carry A-Bomb

- Parasite tactic delivers 'payload' at sonic speed.
- System gives striking range up to 5,000 mi.

By Robert Rife

A new tactic for delivering atomic bombs at sonic speeds over ranges up to 5,000 mi. was revealed last week by the U.S. Air Force.

Known as FICON, the new system combines the talents of the Convair B-58D microcatalytic bomber and the Republic F-84F Thunderbolt, 708-sq-ft fighter bomber, into a new lethal tactic for long-range delivery of atomic weapons at speeds that can be as fast as defense systems in the immediate future.

In revealing the FICON program, USAF brass held the veil of secrecy on its plans (Aviation Week June 22, p. 12) for extending the useful life of its B-36 fleet long beyond the day when it will be superseded by the Boeing B-52 night jet Stratofort as the last true offensive weapon of the Strategic Air Command.

- **Triples Threats**—This program includes three future functions for the B-56 fleet:
 - Aircraft carrier for highspeed fighter planes capable of delivering atomic weapons.
 - Airborne early warning radar picket plane.
 - Highspeed aerial tanker for refueling B-47 and B-52 jet bombers on long-range missions.

Use of parasite fighter-type aircraft was part of the original design concept of the B-36. As each nuclear parasite, the McDonnell XF-85, was dropped in 50 mi. into the bomb-bay of the B-36, initial experiments in attempting to hook onto a target extended from a B-36 parent to hundreds that the project was abandoned in 1945.

• **Severe Draw-Backs**—The FICON project approaches another approach to the same basic idea of combining the extreme range of the B-36 with bettered low-level performance of modern fighters. The system uses a variable thrust after burner that is lowered down the B-36 bomb-bay. The wake consists of a U-shaped funnel with a straiter beam extending down from the bottom of the U.

The parasite fighter is equipped with a probe, anchored on the top of the new funnel of the cockpit. This probe is similar to those used in the probe-and-dragoie skidding method. The beam extending from the U-frame is equipped with a contact hole similar to those skidding dragoies.

Lighter weight and direct contact by engaging its probe with the hole in the wake which is suspended underneath the B-36 bomb-bay. After the fighter's probe is engaged, the U-shaped beam lowers onto the fighter fuselage, holding the plane firmly with a threaded contact. The beam and fighter are then raised by a hydraulic lift to fit snugly into the bomb-bay.

• **Other Trials**—The fighter is shown as far as wing and horizontal tail as a parasite with the necessary air of the plane protruding underneath from the B-36. The F-84F horizontal tail has considerable thrust. This was modified to adapt to the parasite tail to be drawn further into the bomb-bay.

Successful FICON flights with straightwing F-84E and F-84F aircraft were made during the summer of 1953. Later, only one F-84F, the F-84F-1, was used. The FICON technique using the F-84F will be demonstrated publicly for the first time at the National Air Show this week in Denver.

The fighter can be carried by the B-36 during initial takeoff and during cruising flight in the stowed position. The fighter pilot can enter the fighter manually from the B-36 prior to lowering of the B-36 to its low-level approach position. A special entrance system enables the F-84F pilot to communicate with the B-36 crew during the launching process.

• **New Weapons**—Anytime in flight is made according to the procedure described earlier. The B-36 carries housing devices that guide the fighter pilot back to the mother plane after completion of the fighter mission.

USAF official statements pointed out only that FICON would be used for long-range aerial reconnaissance. But the recent Atlantic Foreign Corrosion Commission of a new "Tactics of atomic weapons" study developed and USAF mention that F-84F, straightwing predecessor of the F-84F, had been modified to deliver atomic bombs, make it obvious that FICON has special significance in a new USAF long-range, highspeed atomic delivery method.

Both Republic and Convair have a para-light from Air Force to modify a considerable number of Thunderbolts and B-36s for operational use of FICON.

Still in an experimental state is another parasite device known as wing-by hook-on (Aviation Week Feb.

27, 1973, p. 12). This would enable an additional F-84F to hook on to each wing of the B-36 for a "two mile" to the target area. Using FICON and wing-by hook-on, a B-36 parasite could carry three small atomic bombs across capable of approaching the target at sonic speeds from a variety of directions—a formidable problem for air defense in its current state of the art.

• **Some Draw-Backs**—There is a problem of aerodynamic stability involved in the wing-by hook-on technique, and attempts are now being made to join the wingtip of the attached fighter to the bomber wingtip. It was the type of experiment that sent an F-4 crashing into the wing of a B-29 as presidential planes flew across northern over Hong Kong, lifting both B-36s into and lowering crew.

USAF recently has indicated a growing requirement for defense only varying order to guard approaches to North America, where establishment of a ground side defense chain is difficult, and also to extend the range of early warning radar beyond the list of right territories of ground stations. When Gen. Curtis LeMay was commander of SAC (Aviation Week Aug. 10, 1947, p. 15), he told Aviation Week that part of the B-36 fleet should be equipped as early warning radar picket planes to patrol the Arctic and the air approaches to North America.

The B-36 has the internal color capacity to carry a large quantity of radar and atomic gun with a longer range than any other aircraft now flying. The combination has USAF looking toward B-36 modification as not always to their expanding requirement for long-range radar picket planes.

• **Comparisons**—The large color cap-

acity, plus a 435 mph. top speed, can be used to make the case for the B-36 as a tailer for jet bombers. The speed compatibility between the B-36, going all of its air miles and less at its own, and the B-47 and B-52 jet bombers is considerably better than that of the prime-powered KC-97 tankers now being used for refueling tanks. That delivery capacity of the B-36 is also considerably greater than that of the KC-97 tanker. Convair has equipped several B-36s experimentally as tanker and conducted refueling operations with B-47 bombers. Probably would be feasible to equip B-36s with modifications (not yet present) then to be used interchangeably as bombers and tankers in the field.

Convair still is building the B-36 at its Ft. Worth plant. The last B-36 rolls off the Ft. Worth production line in the fall of 1974. USAF will have a fleet of about 450 composite powered microcatalytic bombers. Cost of the last bomber scheduled to be about \$2.5 million each for the first production order to about \$2 million in current production, despite a drop of 60 percent in labor and materials.

• **Backbone of SAC**—Although USAF originally estimated it would have SAC units equipped with B-52 Stratoforts by 1974, it probably will be at least another two to three years before a significant number of B-52 wings are combat ready and the B-36 actually will phase out in the far future long range SAC bombers.

Equipped for duty as a long-range radar carrier for strategic early warning fighters, as early warning radar picket and as aerial tanker, the B-36 fleet could perform in the USAF active inventory for longer than even its staunchest proponents originally anticipated.

NAA Proposes Design Penalties

A recommendation that the nation's major defense agencies on aircraft firms whose planes had not met original design specifications was made by J. L. Allen, general manager of North American Aviation, Inc., at the air power symposium during the Air Force Association convention in Washington last week.

"I am especially anxious for maximum emphasis in government contracts," Allen told the convention. "Our efforts in industry will be most effective if the competition is tough, fair and clearly oriented toward product quality. There is a disproportionate pressure attached to winning a large competition."

"It is the talent of administration in the production shop, but often of a design is just a lot of promises based on

expectations which are then produced under an assumption that can, with the wisdom of the designers. Really, if not, have there been any real penalties attached, growing from the design proposal were adjusted downward in the present phase of the actual on plan. This is a lot like a change."

• **Design Penalties**—Allen believes this is a serious problem that demands study by all responsible officers of the Air Force and Navy. "If the imposition of financial penalties for non-achievement of performance guarantees is the only workable means of ensuring that such penalties should be levied."

"I believe that most of the responsible engineers, engineers and other executives would agree wholeheartedly with the principle of awarding contracts



ATTACHED by Republic YRF-84F parasite to bomb extended later Convair B-58D.



RETRACTION of Thunderbolt into Convair's bomb bay, after successful contact

STOWED in B-56D bomb-bay (below), fighter can be carried to within target range



UAW Molds Wage-Talk Weapon

Poll of aircraft workers will be used to back union demands during negotiations with NAA next month.

By William J. Conklin

Los Angeles—Local 587 of United Auto Workers (UAW) will use some new bargaining weapons when it begins negotiations next month with North American Aircraft—company that would make the beginning of a new era in aircraft labor relations.

Forecast of this is an opinion poll of union membership made recently by the local to determine the issues most important to its affiliates to follow in the bargaining. Other new "weapons" may include tape recordings of worker grievances and a survey of financial status of Local 587 members.

The idea behind these weapons is that, by far before company representatives could evidence that every membership in backing the demands of its leaders.

Paul Schulte, president of Local 587, believes the local has arrived in the final moment when union must poll their members more widely into participation in union affairs.

The way is opening, he says, where a few lone leaders could for a great mass of disinterested union members who accepted leadership without taking any active part in the actual work of the union.

"There are two techniques, if used right, can lift the labor movement up by its bootstraps," Schulte asserts.

- **Effective Incentive**—That was the original purpose of the opinion poll to bring the membership into active participation in union affairs, to determine what the workers at North American felt were the top issues in the forthcoming negotiations.
- **Attendance at negotiations**—meetings were low and the sessions were falling at their primary purpose to discuss what the members wanted.

"Our problem was how to make the union a more effective instrument for the people," Schulte says. The local has upon the idea of a poll of the members.

- **Postcard Poll**—At a cost of approximately \$300, postcardnaires were printed and handed out at the gate of the NAA plant. These were in the form of business reply cards, which could be mailed to a company street or dropped into the mail postage paid.

Workers were asked to check off what they felt were the three most important issues from a list of issues likely to come up in the negotiations next month and also were asked for written comment on such topics as

wages, overtime pay and pension plans, medical programs and working conditions.

The worker was not asked to identify himself except as a member or non-member and as to his classification: supervisor, guard, welder, assembler, repairer, other worker or technical worker.

With some 1,400 copies in, the local felt efforts were sufficient. Usual ratios for such a survey is 10% or less, officials pointed out, and they had scored nearly 100%.

No advance publicity had been given and yet at least was made to follow up the distribution with ideas for change.

- **The Issues**—The first 1,133 cards tabulated showed these listed as the most important issues:

- **First-class pay**, 502, indicating strong membership support for the UAW-CIO's plan to eliminate the differential between manual and semi wages.

- **Increased holidays**, 501. North American workers this year missed out on Memorial Day and Fourth of July holidays, which fall on weekends.

- **Severance pay**, 438. Schulte believes this revealed concern over the Korean war, with its threat of aircraft layoffs.

- **Expanded health program**, 421. The local plans to fight for a new contract program in the bargaining session next year.

- **Job reclassification**, 211. Elimination of all C and most B classifications is a union goal.

- **Union shop**, 137. Low response to what is often considered a major union objective was due to already high union membership at North American, local officials say.

- **Expanded security system**, 115. Written comment ranged from criticism of the company's "no smoking" rule to suggestions for expanded training.

- **Education**—With results of the poll in hand, union officials set back to survey what they had learned.

"This isn't the complete answer when talking to, of course," says Schulte. "But it gives the people the feeling they are being considered and a chance to put their ideas before the officers. It is a step in the right direction."

The opinion poll also affords the union a chance to discover the views of the workers it does not represent at the plant, the ones who cannot attend union meetings at any event. And if not another election, accord-

ing to effects of the local. It indicates where effort is needed to educate the members in union objectives.

"Just because the people feel a certain way doesn't mean they are always right," Schulte states.

Satisfied with the success of the first poll, Local 587 plans others. One will attempt to determine the need for a grievance pay-program, program, and another will seek out grievances under the present medical program. Both these issues are expected to come up in the negotiation next month.

- **Visible Response**—Schulte picked up the idea of polling local members from the union education service of the University of Chicago's Industrial Relations Center. A noticeable first mover was made by the industry in cooperation with Region 6 of the Oil Workers International Union (OIOW) but Schulte believes it is the first use at such a survey as the recent first mover.

The youthful president of Local 587, who attended Glendale Tech and Yale University, has headed the North American unit since 1951. Working with him on the survey was Al Hansen, editor of the local newspaper, who holds a master's degree from the University of Southern California.

"This new method of getting the opinion and ideas of individual employees at NAA has been valuable experience," Schulte told his union membership recently. "It gave thousands of people a voice in the union's wage-contract proposal. It has provided some very good ideas."

"Yet, I am sure something more. Comments on this survey prove to the officers of Local 587 that most NAA employees are in support of the union and its programs. This is a considerable feeling as we go into the first full wage-contract negotiations since 1949."

The local has other plans in its drive to increase membership participation in union affairs. Then includes an increase of union stewards within the plant from the present with about 1 to every 125 workers to 1 to 25.

- **Union Alliance**—In order to those of Local 587 are spending. The International Association of Machinists (IAM) recently handed out a questionnaire to workers at Douglas Aircraft Co. as a subscription of full contact talks with that company UAW-CIO and IAM will, are expected to work closely that will to coordinate strategy as wage talks at the various aircraft plants.

The UAW already has led North American known plans to get increases in its fight for new contract terms. But the approach of Local 587 serves notice of something more—a movement that over-weighs labor's hand in bargaining with its industry.

B-57 Shows Off

- Martin-built Canberra performs for USAF.
- Bomber demonstrates speed, maneuverability.

By Alexander McNamara

Baltimore—USAF's newest A-bomb carrier, the two jet B-57A (Canberra) produced by Glenn L. Martin Co., this month gave a spectacular demonstration of high-speed flight and low-speed maneuverability.

The new night bomber also displayed Martin's radical involving bomb-bay door (AVIATION WEEK Aug. 3, p. 1) as it streaked the company's report.

First delivery—Watching the demonstration was Air Force Chief of Staff Nathan F. Twining, Air Material Command and Air Research and Development Command chiefs, Lt. Gen. E. W. Rowlings and Donald L. Pratt, and a host of other high brass from the USAF.

At its conclusion, Gen. Twining accepted delivery of the first U.S. version of Britain's Canberra from Martin president George Bortley.

Most impressive part of the flight show was the looped climbing of the airplane, which made a series of tight turns within the confines of the air port—something the low aspect wing and the extra maneuverability it affords to good advantage.

- **British Model**—Deployed on the navy was the second and third Martin-built B-57As, completed and ready for flight test.

A British Canberra Mk. 2, which flew the Atlantic to serve as a model for the American-influenced plane, was parked alongside the B-57A. The Canberra, designed and built by English Electric Co., was a new aircraft record of 51,685 ft. on its first Atlantic flight.

- **Final Assembly**—In the Martin plant, 14 new B-57As are currently being completely assembled as a U-shaped final assembly bay.

Principal subcontractor, producer on the engine program is Hamilton Motor Co. Co., makes all the new engines, and Kaiser Metal Products Div. at Alameda, Pa., makes of the other wing parts.

Hudson was reported ahead of schedule, and Kaiser was shooting for delivery of its 14 sets of parts in get into 900 ahead of schedule in Aug. 31.

- **Bomb Supply**—Purchasing the first Martin B-57As are B-57A-165 Superlight engines licensed by General Wright Corp. to Rock Island Armory, Stoddard, Ind., the original supplier. After more delays and past production



FIRST FLIGHT view (above and below) of Martin B-57A two-jet night bomber shows plan's close external resemblance to the British-made English Electric Canberra.



ROTATABLE BOMB DOOR on B-57A (below) is loaded prior to installation. This door allows bombs out at high speed and exit down to bottom of streamlined open bay.



difficulties, the Sapphire program at Cancon Wright and Bechtel are beginning to "come out of the woods," Martin says.

But Martin says continue to draw engines from both sources in order to keep up with the extreme schedules. (Conspecting with the B-57A for Sapphire, overplants are the Republic F-8H Thunderbolt and North American F-101 Fury fighters.)

■ **Completion**—Inspection of the British and U.S. Canberras at the airport showed less obvious differences except for the "roving dew" bomb-bay and the changes due to engine installation.

The British plane is powered by Rolls Royce Avon, slightly larger in diameter than the Sapphires.

Power ratings are quoted at 7,000 lb thrust for the Sapphire against approx-

imately 6,900 lb thrust for the Avon. G. T. Wilby, Martin vice president-manufacturing, told *Aviation Week* the bomber had been redesigned for quantity production looking after experience of the British Canberra line at English Electric.

■ **Night Intruder**—Primary mission of the B-57A as a night intruder is to find, identify and destroy enemy and fixed targets at night and in low-visibility periods, during the enemy freedom of movement during these periods.

Targets are defined as: Tank concentrations, roads, locomotives, freight cars, boats, tracks, bridges, manufacturing yards, coal loads, radio installations, aircraft on the ground and support facilities.

■ **Versatile Craft**—Versatility of the airplane is accentuated by the new bomb-bay, which can be detached rapidly and refitted to provide a variety of armaments ranging from atomic bombs to rockets.

Originally designed by the British as a high-altitude attack bomber, the U.S. version could be used for this purpose or high-altitude photography with some modifications. The Canberra's superior maneuverability at high altitude would be useful against fast responding fighters, in a certain point out.

Cited is an unconfirmed report of a British Canberra that easily escaped from a receiving F-56 fighter at intense altitude in recent maneuvers. Also, an Olympus-powered experimental Canberra is equipped with attaining a new ceiling of 59,800 ft.

■ **Reception**—The Canberra is designed as a maneuverable aircraft with a broad wing, thin legs in taper outboard of the nacelle.

Landing gear is tricycle.

Tailfin is extremely small compared to most U.S. designs. The entire horizontal tail is designed to rotate hydraulically for variable incidence, protrude at the leading edge.

Wingspan is 45 ft., length 64 ft. and length 16 ft.

Crew includes two pilot and a communications man who manages, operates radio and bombights. Usually he sits to the right and behind the pilot.

■ **March Lineup**—Performance and movement details have not been released by the USAF.

The British Canberra, however, has an estimated top speed of 506 mph. Estimates are that the airplane cannot go much faster regardless of power increase because of Mach limitations at the present wing.

Aviation Week observers at the annual British aircraft show at Farnborough last week (*Aviation Week*, Sept. 15, 1952, p. 14) noted indications of the local shock conditions at various points on Canberra flows in the show—powered by Avon equipped with air-

Missile Team

A nine member Defense Department team, headed by Tamm Gardner, special assistant to the Secretary of the Air Force, expects to complete an evaluation of the guided missile programs of the three services in about two months.

In addition to Gardner, who was assisted by Defense Secretary Charles H. Wilson to head the group, which has been at work two months, the team includes:

Rear Adm. John H. Hines and Capt. William S. Kuylen, director and assistant director of guided missiles, respectively, representing the Navy.

Maj. Gen. Donald Yates, director of research and development, and Col. Robert Johnson, technical advisor, representing the Air Force.

Erig. Gen. K. F. Herford, deputy assistant chief of staff for research and development, and Erig. Gen. Harn Rogers, deputy assistant chief of staff for operations for research requirements and special weapons, representing the Army.

Dr. Thomas Thompson, former vice chairman of the now-defunct Research and Development Board, and Fred Moxon, former chairman of the Guided Missile Committee of the same board, representing the Office of the Secretary of Defense.

observers and by Chicago engineers when the planes made high-speed passes across the field.

Aviation Pioneers Receive AF Awards

Three pioneers in the aircraft industry have received the USAF Exceptional Service Award, highest civilian honor given for non-combat service.

■ **Friedrich Ernst Heinkel**, chairman of the United Aircraft Corp. received the award of the Air Force Award, conferred from Air Force Secretary Harold G. Tibbitt for "helping the U. S. recover its lost ground in the field of jet propulsion."

■ **Donald W. Douglas**, president of Douglas Aircraft Co., Inc., was given the award for his contribution in developing combat and transport aircraft during the past 40 years.

■ **James Harold Kinsley Rogers**, chairman of the board of North American Aviation, Inc., was honored for his entire achievement, "stretching from the dawn to the jet," and particularly for the work of the F-56 Sabre in relieving the shortage of the MiG-15 in Korea.



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Rocket pods and nose for the U.S. Air Force's Northrop Scorpion F-89D, pictured here, are products of Rheem.

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NAVY LIFE GUARD

Small Navy four-place personal plane has been adopted for air rescue missions by the Navy. Douglas Aircraft Co. is assigned company test pilots who may be forced down while flying over water. Plane has a life raft fitted to the bottom of the fuselage. Raft can be dropped overboard while the pilot is in the cockpit. The raft inflates and inflates in 10 to 15 sec. Bottom photo shows pilot (lower left) swimming towards inflated raft during practice.

Aircraft Parts by Eaton

combine outstanding developments in design, metallurgy, and production engineering



Since the early days of World War I, Eaton has made many important contributions to civilian and military aircraft engines in design, metallurgy, and production. Eaton's understanding of the problems peculiar to the aircraft industry has led to the development of unique, high-volume production facilities for the manufacture of parts which meet exacting aircraft standards of quality.

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New B-47s

- AF gets two Stratojets for photo reconnaissance.
- RB-47B is dual purpose, RB-47E strictly camera.

U. S. Air Force is taking delivery of two new versions of the 600 mph plus supersonic jet B-47 Stratojet bomber. Both are designed to carry out high-altitude, day or night photo reconnaissance missions.

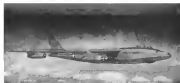
One model is the RB-47L manufactured by Boeing Airplane Co.'s Wichita Div.; the other is a modification of the B-47B—designated RB-47B—turned out by General Aircraft Corp., Tucson, Ariz.

• RB-47L—This version is strictly a photo plane. It features a longer nose than the B-47B bomber turned out by Boeing-Wichita, Lockheed-Martin and Douglas-Tulsa. The new nose carries a number of cameras in an air-conditioned compartment. Equipment includes:

- Interlock system that makes it possible to take photographs of large areas at regularly spaced intervals.
 - Optical windowless.
 - Photocell-actuated shutters actuated by flash lighting for night photography.
- Like other Stratojets, the RB-47L has a three-man crew, the "triple boost" pressure oxygen breathing system replaced by a photophosphor-oxygenator.

• RB-47B—This modification is a dual-purpose bomber-camera plane. It features a structurally modified bomb-bay that can take a pod comprising a complete camera installation. The RB-47B's hot air ducting is modified to maintain the proper temperatures for the pod. Avco Corp., Middletown, Ohio, built the remote pod for the Boeing modification.

The nose of the Stratojet can be converted from a bomber to camera plane by removing the bomb-bay doors, attaching the pod to standard door and bomb-bay fittings and connecting heat and electrical lines to the plane's system. The pod contains eight cameras. Conversion to bomber configuration is equally easy.



FORGING RB-47E camera plane (foreground) flying with B-47E bomber. Note longer nose on RB-47E compared with that on B-47B. Both planes have side-mounted jet fuel intakes.



PLAN VIEW of RB-47E Stratojet provides a good look at the 600-mph plus plane's supersonic configuration. The model of the aircraft camera pod is in use.



CLOSEUP of RB-47E camera pod with B-47E bomber in warlike background points up differences in planes. Arrows indicate (1) cooling and fuel, (2) camera installation exit.

DH Halts Drover

(McGraw-Hill World News)

Sydney—Production of the jet to carry storage drover for water transport has been halted by the de Havilland Aircraft Pty., Ltd., of Australia near Sydney. Space used for Drover output has been converted to assembly of DH Vampire jet fighters.

AF Completes Civilian Command

Nine new Deputy Assistant Secretaries are appointed to materiel and management, boosting top chiefs to 16.

Nine new Deputy Assistant Secretaries have been designated, completing Air Force's top civilian command that now adds up to 16 secretary-level chiefs.

Four of the Deputy Assistant Secretaries serve under Assistant Secretary for Materiel Rags Lewis, and five are under Assistant Secretary for Management H. Lee White.

The four under Lewis:

- Deputy for Procurement and Production, Neil Gaskin. He headed chief procurement matters for former Undersecretary Russell Galtzie, was a New Jersey attorney.

- Deputy for Materiel Programs, Myron Toney. A career government employee, he served as chief of the office of security programs in the Munitions Board until it was abolished recently. During World War II, Toney was an industrial agent with the War Production Board, later served on the Strategic Bombing Survey Mission to Europe and subsequently became assistant executive secretary of the Air Corps Advisory Committee.

- Deputy for Materiel Security Assistance Affairs, Charles Shaw. During World War II, he served as an Air Corps pilot and engineering officer, later became cultural aids development manager for European Air Lines.

- Deputy for Chief Aviation, Bradley Nuth. He served during World War II as financial adviser to the War Production Board, also was executive consultant to the National Security Resources Board and recently was appointed consultant on President Eisenhower's Advisory Committee on Government Organization, which recommended reorganization of the Defense Department.

The five Deputy Assistant Secretaries under White:

- Deputy for Contract Financing, Charles Seftensberg. He has had authority over guaranteed loans to civilians and other types of Air Force financing since 1950. Lawyer and banker, Seftensberg served as deputy chief of management control of the Air Materiel Command under the late Lt. Gen. William Kinnear during World War II. He is a former vice president of the First and American National Bank of Dallas and former president of the Wisconsin Trust Guaranty Association.

- Deputy for Accounting and Financial Management, Robert Benson. His job will include auditing of USAF contracts. An accountant, Benson was a partner in the Kansas accounting firm

of Wilkins and Benson. During World War II, he served at Wright-Patterson AFB as chief of the fixed price audit branch and chief of the procurement audit branch.

- Deputy for Budget and Program Management, Hyde Galtzie. A graduate of Princeton and of Harvard business school, Galtzie is a partner in the New York and Chicago investment banking firm, Glott, Foggin, and Co.

During World War II, he served as a Naval officer, handling overseas procurement and material matters as the Office of the Secretary of the Navy.

- Deputy for Manpower, James Goodie. A Connecticut engineer, he has served eight years with the Secretary of Defense Commission.

During the war, he served as chief of personnel in the Air Force Training Command. • Deputy for Reserve Affairs, Chester Seftensberg. He also is filling the post of Deputy for Contract Financing.

FBI Arrests Suspect In Plane Parts Ring

Federal Bureau of Investigation is suing a Seattle man described as a "barren dealer in airplane engine parts" in connection with a Civil Aeronautics Administration probe into what may be a nationwide ring dealing in illegal unapproved commercial aircraft parts.



TRAINING TARGET FOR MISSILES

U. S. Army Ordnance has ordered production models of the Ryan XM1E1 Proctor in taking anti-aircraft tests at one of Sky weapons gun and Nike and other ground-to-air missiles. One a Proctor is Army making is now mounted on a dolly. The biplane Proctor can be converted to

The unit is charged with testing the sound of an automatic CAA receiver to a form required for approval for use of a modulator for a Proctor & Whitney engine.

Two engine crankshafts considered unserviceable because of pits and flaws, which had been covered with solder, have been accepted, the FBI has reported.

Officials have been investigating to determine whether vital engine parts sold by Air Force for sale are being peddled to unsuspecting operators of commercial aircraft.

One source indicated there is a move to believe such dealings are widespread and may involve hundreds of thousands of dollars.

YH-21 May Be First Copter at North Pole

Military authorities are specializing that two Pacer's YH-21 helicopter sent to the Arctic, Greenland, may be the first copter to fly over the North Pole.

The YH-21 will undergo two months of Arctic field tests at Thule to determine their operational capacity in the light snow for which they were designed.

The helicopters were flown this month out of Eglin AFB, Fla., where they have been undergoing tests in a scheduled loop (Aviation Week, Mar. 9, p. 9). The flight from Florida to Greenland was expected to take 15 days.

Crews were loaded on Arctic flying at Western AFB, Minn.

Are retained lubrication and long bearing life vital?

here's how leading harvesting machine manufacturers secure them with **NEEDLE BEARINGS**

Torrington Needle Bearings are important design features on many harvesting machines because of their unique ability to retain lubricants, and because of their long service life.

They have been performance-proven in machines which handle a wide variety of crops, on every type of soil and terrain—including machines, even on rolling patterns, mowers and other miscellaneous harvesting equipment.

Needle Bearings in such machines are found in main drives, gears, shafts, mandrels, belt cracks, idler pulleys, sprockets, steering gears and auger bearings. The small but rugged Needle Bearing has capacity for long life under punishing loads and severe operating conditions—often present in the use of such equipment. Furthermore, the tapered-in lips of the Needle Bearing's outer shell retain lubricants for long periods—reducing down time for replacement to a minimum.

Needle Bearings have become "standard equipment" throughout industry since their introduction nearly twenty years ago. Their low cost, small size, and ease of installation make them the natural choice for increasing numbers of anti-friction applications.

Torrington Needle Bearings may offer a solution to your bearing problems. Our engineers will be glad to help you find out.

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Trade marks of leading manufacturers of harvesting equipment also use Needle Bearings.



AF Tests Rocket Engines in Giant Stands

By David A. Anderson

Edwards, Calif.—At the speeds expected of tomorrow's missiles, half a million pounds thrust means two or three airfields horsepower.

No ordinary test stand could handle such an astronomical output. That is why there are two extraordinary rocket engine test stands anchored in the granite Leachman Ridge at the Air Force Flight Test Center.

Three thousand feet above the sea, overlooking the Mojave Desert, the dazzling white concrete and aluminum buildings of the Experimental Rocket Engine Test Station are spread over a sloping plateau. Topping the plateau are the giant test stands firmly anchored onto the granite mountain ridges.

It is hard to appreciate the size of the test stands when they are seen through Joshua trees that flank the road up from the dry lake bed. They are dwarfed by the mountains that enclose them.

► **Granite Mountains**—Seen again from the ridge top above the three pits and fuel storage tanks and the motor and pumpage they look like giant granite mountains. You walk out on a road just sign, climb under a pipe and step over a chain as you work your way toward the rocky side of the stand.

Constantly leaning against the railing, Don Dewart, chief of the Test Operations Section, says, "Down there is the three pit." You walk to the edge, look over the railing—and brief sections of vertigo hit you.

"Down below" is over a hundred feet below, and it's a pit floored with concrete, studded with huge bolted tie beams. It is over it and you are a solitary steel girder and a pipe railing.

Then on another just how big those test stands are.

They've got to be big, of course. A test stand designed to handle half a

million pounds of thrust has to be big.

That was one of the reasons the stands were built by the Air Force. The reasoning was that if any contractor were to build and operate such a huge facility—financed by the Air Force, of course—the mere possession of the test stand would give him the inside track, if not the only one in the area, when it came to getting contracts for high thrust rocket engines.

So in 1946 the powerhouse lab at Wright-Patterson decided the only solution was to have the Air Force build and operate the stands for use by all rocket contractors.

► **Design and Installation**—The site was chosen in 1947. Complete design and construction of the facility was handed over to the Aerojet Engineering Corp. Their first job was to develop a set of design criteria. They were instructed to identify the environment and suggest the most space saving to maintain Air Force installations.

Aerojet reviewed all the loads and loads, then replaced their design specs. Construction began in 1948

with the U. S. Army Corps of Engineers pouring concrete and welding steel.

Current Status

The first test run was in July 1951, and the first high thrust test was made last November. Both stands are now in operation, and a maintenance station was working a 28-hr, six-day week on a split-shift basis.

► **Aspects From WADC**—The work load and growth are projected from the rocket engine development center. Although the present statement of the station plans equal stress on "on-shelf" research and development, and service to contractors, the greatest feeling at the test station is that the primary job is service.

There were two major projects at the station during mid-June. Mission for Boeing's B-57 and North American's Navion. When you discover both stands are tied up for two months (a big part of the test, and the quantity of space occupied by the two contractors in shops, administration buildings and technical shops, you begin to agree some is a little job.

Test Stands

Handling the enormous control room, the test stands are out of the ridge like Tibetan temples.

"Imagine what it's going to be like as a couple of thousand tons," said one observer. "When some rocket engine explodes, you're not to figure out the religious practices of the 20th Century from one of its larger temples."

► **Construction**—Each of the stands are powered 14-in. wide, large steel H-beams which are vertically into one concrete anchorage deep in the fractured granite of the ridge.

Steel and concrete are on form tied with the major bulk of the structure, thousands of tons of reinforced concrete laced into the slotted steel by pre-stressing.

In some places the concrete, which was forced into the full structure under pressure, has penetrated 300 ft. below the surface.

► **Appearance**—The general design of the stands is a monolith with nine bays for propellant, and a cantilevered pit from several dozen high, sitting out over the top. Up here the motor and tanks and associated plumbing are mounted.

During a test, the flame from the rocket engine drives vertically into the flame pit (see below). "The concrete is the pit spalls in three or four minutes of testing with 50,000 lb thrust," said Dewart.

Located all over the stand are reserves for withstand of fire protection. Wide open, they can pour a drenching 4,500 gal per minute to flash fire and even so far into the walls.

► **Propellant Tanks**—In high bays to left and right of the stand are propellant, stored in stainless steel tanks which are long for weighing to determine fuel flow. The tanks weigh 11 tons each, empty, there are two on a side. Capacity is 157 cu ft of liquid at an operating pressure of 1,100 psi. Wall thickness of the tanks is one and one-third seconds of an inch.

At the entrance to each of the stands is a small shop, called the test stand shop. Its construction is unique, because it's designed to fall partially in the event of an explosion in the test stand. The lower part of the shop is heavy steel (thrust, stopped to show are corrugated sheets, a thick wall across the skirt and leave the structure.



HUGE TEST STANDS turn rocket engines between one eighth concrete tower it try. Rocket exhaust flows down into flame pit of bottom section of pit area.

Control Room

Staff down at night angles, first concrete walls and they window with steel blast shields protect the control room, the crew-and personnel—control during a test run.

► **Firing Details**—Here in this air control room are the firing controls, all recording and observation equipment used during tests. Directly in the center of the layout are the banks of oscilloscopes, galvanized in punch by Aerojet, assembled and maintained here.

On opposite sides of the platform of instrumentation are the firing switches, studded with banks of toggle switches for the multitude of events that must be activated in sequence to fire a rocket engine.

Between recording equipment and controls are periscopes—a total of six in the room—which can be turned to either stand for direct observation of the firing.

Typical Test

Rocket engine tests have a characteristic sequence about them. If you're out there, you're seen there all. The stand may be empty, the scene loaded, or the fire lights, but the same picture runs through test after test.

First, the warnings. At this station there is a four-light warning system, looking like traffic lights everywhere you travel through the station. When the green light is on, the entire area is open.

► **Threats**—Zone—Area-clearing starts with the general order signal, and outside who don't have business during the test gets out to one of the side areas. The station is now in safety. "We dropped some shrapnel 2,000 ft. now more about a good blowup. It's probably, not beyond that distance."

Clearing order men takes about 15 minutes, then the general and signal goes on. Nobody moves except the fire.



MIDDLE of Edwards' rocket test stands



PITS, and engine storage tanks



PERISCOPES for viewing test firings



WARNING LIGHTS help clear the area.

Airborne Actuator for the Sturdy Savage



Try but cement—that's the LINEATOR® Electric Linear Actuator. Hugs but hardly—that's North America's new KAZI-I Savage. Combined, they do a job for the Navy.

The R-144 M16 Lineator is used as the actuator in a temperature control system furnished by Airborne. Other models and similar Airborne electrochemical units are standard equipment in Navy Service and civilian aircraft. You'll find data on Lineators and other Airborne actuators, motors and ANGL gears in the Engineering Catalog of the Institute of the Aeronautical Sciences. We invite inquiries

AIRBORNE
ACCESSORIES CORPORATION
1414 Chestnut Avenue
Hillsdale 5, New Jersey

ing personnel who take over as the cockpit crew.

► **Observation**—Down on the floor of the valley, a little yellow M-55 tank—the only tank in the Air Force—can't leave the floor pit. With turret removed, it has been converted into a mobile observation post for two men. It can stand around where the outside air temperature is 100° and not bother the observer inside.

Two minutes later the starting guns of the show work up to an emboldening attack, and inside the control room the countdown begins.

Firing starts on the marker's "Zero, READY" at the countdown, and from there on—... the game tale over—

in one engineer and.

A successful firing is followed by a ground team signal again, with another on the tank stand only. If the rocket burns or blows instead of blasting, the emergency and signal—controlled by a keyman on standby from the station—shows and immediately there is caused subtle activity.

Instruments, Gadgets

The gamut of electronic moods and moods in the cockpit may be described in four ways. Back on back of Spence, Brown and Wanda's black manual indicator light boards, which set the status of records, is a cluster on standby in operating.

► **Complexity**—The cabinet shown which contains three remote modules arranged in a hollow rectangle, with the speed module taken up with wiring and additional wiring for other auto systems. When not back behind one of these sides, it sounds you of the back of a large dual telephone exchange.

When thousands of wires, thousands of feet of wires—run singly and in tied bundles in an impressionist pattern—in these dimensions.

Cooling wires in such a case is an absolute must. Over in one corner is a little gadget called the Ringier strap-on. "Watch the weight in gold" and use technique. "TVI" was a kill a rule of wire through in about five minutes and strap it every two inches with a needle.

The next step in instrumentation will be the installation of television for direct observation of the firing and the three pattern. Windows and periscopes feed new live transmission, to data television, but the combination of all these systems should give effective results.

Future Plans

The test plans is still expanding. Next year, the staff hopes, they'll be able to begin the construction of an resistant aircraft stand. This unit will be

Added Starter

Douglas Aircraft Co.'s El Segundo Div. has added a new aircraft starter to the growing list now available. The Douglas unit is a portable, self-contained gas turbine compressor that is housed in a distinctive wing cut for ferrying by aircraft in forward bases where it is disassembled and used as a ground starter. It moves the payload of constant altitude by shortening the need to carry heavy built-in starters on missions.

The portable compressor is now used in the F-105 Skyhawk and the A-1H twin-jet bomber, Douglas reports.

used to short out into units for planes in four days of work.

In the future, the two big stands will be joined by a third. A third stand will be used for the live display of the stand load-handling equipment.

► **The Big One**—Then sometime later, the station hopes to have a "major test stand." Design studies on the hardware are being developed, now by Acceptor and North America. Potentially it is considered in a stand which will be able to mount the largest foreseeable missile complex and give a perfectly clean firing.

The station staff is also considering construction of a pre-test stand where they would run radio-frequency studies on missiles, or perhaps check system on them. It would be a stand of equipment to use much time on the main stand by performing a large number of checks before the first run.

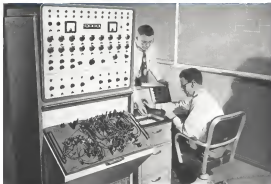
► **Unification**—One of the big worries about the complexity shown is a reduction of the test stands in the future as work loads increase. Right now, each of the four on the stand is spent getting ready for the actual firing, which may last from a few seconds to about a minute. Hours of preparation precedes that short firing.

They have noted two options in a single test in the same time, and they feel that if they had to—that number could go to ten at once. But even multiple firings would not compensate for the complexity here.

Decent and that considerable engineering effort is going into stationing studies, and that the answer seems to be in developing a quick-disconnect technique for rocket engines.

"We'd like to be able to hook three up, fire, unhook and what some more with the test will just as fast as we can move engines around. When we can do that, we'll really be able to find out something about rocket engines."

BEST WAY TO GIVE YOUR HUNCH A CHANCE



ENGINEERING programs are undergoing a revo-
lution, thanks to GEDA—the Goodyear Electronic Differential Analyzer—a compact analog computer which greatly accelerates the design of complicated equipment and systems.

A big advantage of GEDA is the fact that engineers do not have to learn specialized mathematics in order to use the computer. Once the block diagram is laid out, it is a simple matter to set it up on GEDA's problem board.

The results are shown graphically. Consequently, GEDA provides the engineer with a better understanding of the system under study because the solutions are produced in a form already familiar to him.

So now he is encouraged to "play his hunches." A

new idea can be tried out as a component of a system can be changed so easily that new approaches to a problem can at last be profitably explored. Even problems dealing with dynamic systems, where conventional solutions seem impossible or too time-consuming, can be solved by GEDA.

The GEDA line of equipment includes both linear and nonlinear analyzers, mechanical console recorders, and curve-followers—offering flexibility and scope to meet specific individual requirements. WRITE FOR BROCHURE and details. Goodyear Electronic Analyzer, Dept. D-66A, Akron 15, Ohio—for over five years a major supplier of computing equipment, operator of one of the world's largest computer application laboratories.

OPPORTUNITIES UNLIMITED for engineers!

Goodyear Aircraft has many opportunities in research, design development and production of ELECTRONIC COMPUTERS • AIRCRAFT • AIRBORNE • HELICOPTERS • GROUND MODELS • AIRCRAFT COMPONENTS • MEASUREMENT EQUIPMENT • RADAR • REMOTE MEASUREMENT EQUIPMENT • RADAR • WEAPON TRACKERS • and in many other allied fields.

Send us your record of your qualifications and experience in your field. We will send you further information. Address: Dr. E. J. Anderson, Vice President of Engineering, Goodyear Aircraft Corporation, Akron 15, Ohio.





"Plug-in, plug-out" simplicity in Avien's "TWO-UNIT" FUEL GAGE

This "repackaging" of Avien's capacitance-type fuel gage is 50% lighter and needs no field adjusting.

Up until now, most fuel gaging systems needed four units, a tank unit, an indicator, a bridge-amplifier and a shunt/comp. No field calibration was required for the Avien tank unit or indicator. Avien held them to such close tolerances, the adjustments for full-scale zero tolerance were virtually "built-in." The bridge-amplifier (the "black box") was a discrete part, for universal appearance. And that's where field calibration had to be made.

There was only one answer, as far as Avien was concerned. The "black box" had to go.

Now, at the Avien Two-Unit system, the necessary components for the bridge and amplifier functions have been built into the indicator unit. The "black box" is eliminated, and so are many parts which were necessary to make the "black box" successfully operable.

The Two-Unit Gage gets installation done in "plug-in, plug-out" simplicity. No more field calibration is necessary — and the reason that all units designed for the same aircraft are interchangeable. Avien units are now all "built-in."

To install the Two-Unit Gage, you don't need trained personnel, you don't need special tool equipment, and you don't need calibration instructions or data.

The new "pecking" brings savings all along the line. The basic system is reduced in weight by 54%. Installation time is cut, less wiring and components are needed. Less maintenance is required. Trouble-shooting becomes easier. And fewer parts need to be stocked for maintenance and repair.

As in the previous systems, additional functions for fuel management can be incorporated into the basic gage — and with less complexity than ever.

The Avien Two-Unit Gage is now available to meet your manufacturing schedule. The indicator is available in either large or small size, with all varieties of dual configurations. Every month, Avien produces over ten thousand gages for instrument components for the aviation industry.

We believe that Avien's Two-Unit Gage will contribute to the advancement of many earlier systems, including our own. For further information, write or call us.



AVIATION ENGINEERING DIVISION
AVIEN INSTRUMENTS, INC.
24-15 NORTHVIEW AVENUE, WOODBRIDGE, L. I., N. Y.

Roto-Finish Tumbling Machines Save Money

Thousands of dollars are being saved by a battery of fine Roto-Finish tumbling machines recently installed at Ryan Aircraft Co., San Diego.

An analysis of the first two months of operation indicates that an deburring operation for jet and turbine engine parts, at nearly as \$100,000 may be saved annually with the present savings work load.

► **Rounder Smoothing**—The tumblers, also are being used to remove very fine burrs, finish weld flax and heat-treat scale, eliminating the need for the slower sandblasting method.

Grinding chips (stones) are stored in large bins and fed into tumblers. A crane lifts the pan and pours the stone into the tumbling machine opening. A detector compound is water also is poured into the cylinder.

► **Right Finish**—Most of the deter-

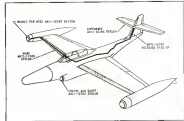
grants are obtained from the tumbling machine manufacturers. But for removal of fused welded flux and for particularly bright finish on stainless steel parts, Ryan has developed its own compound—Roto-Finish 218—a formulation of acids and wetting agents.

An automatic timer stops the tumblers at given rotation hours, and the parts and chips are unloaded into the haul pan.

The tumble-charged parts are straightened from the chips in a mechanical separator, and the chips then returned for use.

AF Orders Mobility Boxes

An AF contract for production of a limited quantity of Becker & Berntson mobile supply containers (ANALYST WEEK July 15, p. 55) was won by the Multiple Boxcar Co., Boston, Mass., in open bid competition. The containers are designed to improve mobility of USAF units.



SCORPION seeking airborne details during low jet engine, to wings and tail.

Thermal Anti-Icing Shields F-39

Northrop Aircraft engineers have developed a "highly effective" thermal anti-icing system for the F-39 Scorpion, scheduled for delivery later.

The system takes care of the Scorpion's wing, empennage, wing root pylon, windward leading edges of cargo trailer doors and forward frame components within the doors.

► **Engine Protection**—The engine leading edge and powerplant component system, unlike high temperature air bleed from compressors in the fighter's F4U Allison J75-A-15 jet engine. Ducting takes the air to proper locations (as shown at F-39 above).

The engine receive additional icing

protection in satisfaction of contract that aircraft manufacturers guarantee the plane in airborne or if icing conditions prevail while the craft is on the ground.

► **Windshield**—Subzero-Exhaust reverse heating is employed to avoid the windshield, heat vents and other sections.

The windshield uses a transparent electrical heating unit on each side of the glass to take care of reheating the exterior and anti-icing inside. In normal flight both elements are heated continuously.

The pilot can stop at the heat output of the outside element in case of emergency.

WHEN THE PRESSURE IS ON



only an **ADAMS-RITE** lock will do...



NO. 1561 LOCK ASSEMBLY

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NO. 1570 LOCK ASSEMBLY

Another Thompson "First"...

T.P.M.

**makes the big difference
in valve life**

ORDINARY VALVE



T.P.M. VALVE



These two Thompson valves from Pratt and Whitney Aircraft R-4360 Engines were photographed after first overhaul.

T.P.M. is the new valve material developed by Thompson to give greater corrosion resistance and higher strength at valve operating temperatures. T.P.M. is a result of Thompson's vast experience in valve development and knowledge of the behavior of metals at high temperatures.

Other Thompson "Firsts" include a new coating alloy for valve heads and faces, and steam-peening to provide harder, more wear-resistant stem surfaces.



VALVE DIVISION

Thompson Products, Inc.

DEPARTMENT 6644 • BUREAU, IND.

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FOR ENGINEERING LEADERSHIP

to maintain familiarity with new materials and processes, which may be required for future potential production parts. Some production vendors are reluctant to accept experimental work. This is considered a downright policy.

It is the responsibility of the prime contractor to monitor, where possible, sufficient volume of work with experimental vendors to keep them operations on a financially sound level. It is also his responsibility to educate and sell production vendors on the benefit of doing experimental work.

• **CAN the prime contractor select the experimental vendors to be used, under a kind of pre-approved contract?**

Usually, prime contractors are responsible for the selection of experimental vendors. But placing of the orders with these vendors is subject to government approval. Improving these bids in many cases. The rules governing these procedures vary, depending upon the procuring agency's interpretation.

• **ARE vendor quality control facilities investigated before orders are placed?**

Usually, representatives of the prime contractor investigate facilities and quality control methods used by potential vendors when approval or critical processing is involved, and especially where the product is in receipt upon which inspection of all details prior to assembly is required.

• **DO prime contractors handle inspection two pages and fixtures to vendors?**

In experimental procurement, vendors are not furnished with inspection tools and pages, except in unusual cases.

Tooling Factors

• **WHAT percentage of experimental parts are used in production?**

For an approximation, one out of every three experimental part numbers may eventually be used in production. Hence, it is advisable to run temporary tooling. Also, temporary tooling is desirable because engineering changes on experimental parts are obsolete a portion or all the original tooling.

In most cases, the experience and ability of those working on experimental tools is more important than the degree of tooling.

• **ARE experimental parts processed by modifying production parts?**

In some cases, experimental parts can be obtained by modifying or overworking production parts, or they may be ordered from a production source.

• **DO experimental delivery dates usually limit the vendor's available tooling time?**

In some cases, experimental delivery dates are so short that cooperation is required tooling on made to meet the deadlines. Here again, reliance upon experience and ability of personnel is

vital to make any play.

• **Should inspection tools and fixtures required for experimental work be kept to a minimum?**

In the interest of cost it is usual to keep all tools and fixtures to a minimum. But, to make the proper use of comparison experimental parts, prime contractors may furnish the vendor with the necessary tools—drills, gages, etc.—to have the vendor maintain these similar tools for itself and the prime contractor, where similar parts are made in two copies.

When duplicate tooling that the vendor cannot report would not necessarily improve the percentage of experimental parts accepted and might go with together the delivery date of the parts.

There are many cheap types of tooling, such as concrete forms used by machine manufacturers for stretch forming operations. Kerosene tools which can be rented often are used to salvage the

tool material and the fixtures. Some tool material also has been successfully used by manufacturers for roll forming operations.

• **ARE material substitution and dimensional deviations permitted?**

When checked and permitted, material substitutions and dimensional deviations are accepted on experimental parts in order to allow delivery. In all cases, however, when these decisions are made, it is with the full knowledge of the engineers involved and are usually restricted to one or two parts on the order.

Liaison

• **SHOULD engineers consult with manufacturing groups prior to finalizing designs?**

Prior to the release of an experimental design, it is most desirable to have constant contact between the design



CONVARE MONEY-SAVERS

The employee-machine system has saved Consolidated Valve Assembly Co.'s San Diego Division about \$14 million in some factory costs in a seven-month period. Employees substituted 4,560 hours in this period—more than 40% over the number needed in the corresponding months last year. One of the suggestions, which eliminated hand-loading operations, resulted in the sheet-loading rack (below), an idea saving 56,500 annually. The rack holds 160 drawers, slides for drawing operations. Each sheet is supported by vertical rods to prevent warping and entry marks. An overhead crane moves the rack and lowers it into the drawing tank. The result of another suggestion is the "lens wheel" (below right), which eliminates horizontal necessity of left hand. This release is saving Convare about 32,000 annually. Suggester



no. 4195780—submitted from a suggestion which initiated a new program for coloring and coloring extension. Convare's San Diego "factory" and this year is targeted at 54 million.



Vibration-proof insulation for aircraft...

Pittsburgh Superior Fiber Glass withstands vibration and actually tends to expand under these conditions. Other important reasons why this material is ideal for many aircraft applications include: exceptional lightness in weight, efficient thermal and acoustical qualities, ease of handling and installing.

Pittsburgh Superior is made in the special aircraft grade—"AA"—and in the "B" fiber, which also has many aircraft applications. It is available in a range of densities, thicknesses and blanket roll sizes. Various binders and finishes are also available to meet varied requirements.

Our technical staff will be glad to supply complete information and assistance. Pittsburgh Plate Glass Company, Fiber Glass Division, 420 East Biquanette Boulevard, Pittsburgh 22, Pa. District Offices: Chicago, Cincinnati, Cleveland, Detroit, New York, Washington.



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PITTSBURGH PLATE GLASS COMPANY

engineers and the manufacturing group. This liaison should be extended by involving engineers, if they are known at the time the design is being prepared. In this way potential design tolerances can be obtained.

Sometimes the design is evaluated by the production manufacturing group before release for experimental manufacture. Alternatively, designs are reviewed by production departments after experimental manufacture, but prior to release for prototype quantities.

• HOW does engineering fit into quality control?

Project engineers, with the assistance of the inspection department, establish the quality control functions on experimental work. The manufacturing group as the vendor must request approval of any changes through the project engineering group before proceeding with the job. All these changes should be reviewed by engineering and experimental manufacturing personnel before release. If this procedure is followed, all errors clear flag required can be cleared with resultant economies in manufacture.

• WHAT happens when experimental design gives a part that is not adaptable to production processes?

If correct evaluation has taken place between the design and manufacturing groups, there should be no parts which cannot be adapted to a production process. Very accurate tolerances and great expense will result if the design is not adaptable to production methods.

• WHAT is the normal liaison between engineering and engineering groups and vendors?

The normal method is for the production department to make and maintain all contacts with the vendors, following the engineering on all processing problems. Frequent trips by vendors personnel to the plant contractor's facilities also help in clearing up any misunderstandings and in visiting with-while changes in procedure.

It is essential that the experimental manufacturing group inform the engineering department of variations and deviations on experimental parts, so that accurate records and drawings can be kept. Some manufacturers require production personnel to participate in the manufacture of experimental and prototype parts to assist in the problems of transition from the experimental to the production phase.

Special Control

• WHAT are the basic difficulties in adapting foreign designs to American practices?

After the first evaluation of a foreign design and documents with engineering



The "Know-How" to Mass Produce Precision Hydraulic Equipment

The hand pump shown above is a typical example of Warner's ability to mass produce precision hydraulic equipment. This pump is used in connection with a special aerospace application requiring high volumetric efficiencies and must be produced to very close tolerances.

Warner is qualified by experience and facilities for the design and production of hydraulic equipment for a wide range of uses.

Warner engineers will welcome an opportunity to assist you in the development of special hydraulic equipment to meet your particular requirements.

Send for your copy of an illustrated folder describing typical examples of Warner Hydraulic Equipment.

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DESIGNERS AND MANUFACTURERS OF PUMPS • VALVES • ACTUATORS



engineers, the transition to American positions can be made fairly smoothly. It is believed that both foreign aircraft and engine have involved the use of far greater information than are considered reasonable by American production standards.

It is felt also that foreign designs have been made quite independently of the manufacturing problems and process so as to avoid the usual learning curve as not needed the same degree of participation common in this country. Also, foreign machine tool equipment starts the use of our higher production standards, and production quantities involved are much smaller than that accustomed to be handled here. However, foreign production models appear to be kept more up to date with changes than are American designs.

It is believed the apprenticeship training program in use in Europe are capable in those areas and are used extensively to develop the manufacturing skills by most means in the aircraft business.

•HOW are optimum tolerances for both design and processing requirements obtained?

•While tolerances are usually defined by engineering and manufacturing personnel. The development team of the experimental model finally establishes the minimum tolerances permissible without detrimental effect to the product.

•Does production activity tend to restrict engineering to design and tolerances required for cost manufacturing?

A reasonable compromise is required between the design and manufacturing process requirements and manufacturing cost to give the necessary aspects of each problem. Production tolerances sometimes can be increased as a result of successful experimental tests on parts which have had dimensional deviations accepted for this purpose. Thus is a confusing situation in the development of any product and one which divides the contact between engineering and manufacturing groups, the better and cheaper the resulting product.

Shop Divisions

•ARE most facilities divided into experimental, development and production departments?

Two systems are advocated for the transition of projects from the experimental stage to the final production version.

The three-stage system requires an experimental, development, prototype shop and a production facility. Here, the experimental department is responsible for all manufacturing and testing required for acceptance of a given design, which then is passed over to a

prototype shop capable of producing up to a maximum of 30 units per month, while the production activity uses the experience of both experimental and production departments in arranging for tooling for quantity manufacturing.

In the two-stage system, the experimental department is required to manufacture the shop units and the production department immediately takes over fabrication of prototype and production quantities.

•ARE complete units built in the prototype department?

It is usual to build complete units in prototype production for limited quantities of new designs, using the experience gained to assist the production department in obtaining the equipment to produce the new design in quantity.

The prototype production department may also be used for assembly and finishing production designs, starting as general to accelerate the incorporation of needed changes. This prototype facility usually gives advantage of some of the experimental services used in manufacturing the initial parts of a new design.

Experimental department eliminates production manufacturing problems, whereas the two-stage system requires the production department to handle all prototype components over and above the initial experimental quantity.



ONE PRICE, TWO WHEELS

Experimental design turbine and shaft, as integral configuration modeled by Anson Products Co., Hillside, N. J., for Reaction Motors, Inc., Rockaway, N. J., needed 60 high pressure bolts and 124 subbolts. Reaction Motors, Inc., needed from a single shop design of Anson Products Co. Inc.'s Inco-1, the only bolts are sold in thousands of 300,000 lb, while shaft is machined to 0.0004 in. toler. Work was done on a modified Gas Engineering machine.

Whether way the problem is solved, it is crucial that a considerable amount of time be spent by the personnel of the department involved in complete the special detailed fabrication for the manufacture of the parts required. The real costs of the two systems can hardly be compared without knowing the general quality of operation of the company concerned.

•SHOULD the experimental department be a part of the production department or a separate unit?

The numerous questions that experimental work should be separated from the production department, even as relatively small plants, because any combination inevitably would be to the detriment of the experimental work involved.

•WHAT is the best source of experienced engineering and manufacturing personnel?

Personnel should be upgraded from various production functions to the experimental department to obtain the benefit of their manufacturing experience.

Because greater skills are required for experimental manufacturing personnel, it is usual to make these positions more attractive by increasing the salary for equivalent experience in cooperation with the production wage scale and applying a shift differential when two or three shifts are worked.

Schedules

•WHAT are the scheduling requirements for experimental manufacturing personnel?

A general outline of an experimental scheduling procedure includes these steps. All parts are estimated for time and cost, parts are scheduled in a master and subsequent parts during manufacturing schedule and progress of parts are checked periodically.

Time cards are prepared, showing a selection of status of parts in schedule by indicating a "plan" amount of time for parts ahead of schedule and a "margin" amount of time for parts behind schedule. Parts marked status are given priority for available manufacturing time. The scheduled manufacturing day indicates date completion of part is to start. The scheduled manufacturing work indicates completion date of the part. An IBM system of scheduling parts to maintain the work, required in changing schedule frequently is used.

•WHAT is the ratio of design time to manufacturing time?

Time required to manufacture parts is equal to or is up to 150% of design time depending upon the design phase of the part. The time to "manufacture" is divided into 25% for processing, 50% for tooling, and 25% for manufacturing.

Westinghouse Upping NACA Tunnel Power

National Advisory Committee for Aeronautics is converting a 19½ hp test windmill at its Langley Lab center into a turbine facility. Westinghouse Electric Corp., Pittsburgh, Pa., will replace the existing 5,000 hp motor and fan with a new 20,000 hp drive and fan. The motor will be installed in the tunnel and connected to the fan shaft.

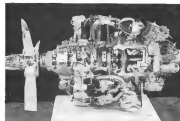
In addition to the new motor, Westinghouse is supplying a 35,000 lb turbine having 22 and 110 in. tips, a liquid alcohol fan secondary control of the motor, and other auxiliary equipment.

The motor's full 22,000 hp will be supplied at two different top speeds, between 600 and 800 rpm, and will be used in conjunction with the tunnel.

Bathing Cleans Dies Faster Than Grinding

Dieplexer cleaning that took eight hours a week is now done in 16 minutes at Tronac Aircraft Corp., Dallas. The parts are now bathed instead of ground.

Grinding did the job satisfactorily, but the procedure required an average of a month per part. Consequently, dieplexer could save design to the die then did the design work which was to be finished. Also, dieplexer showed did not fit the small contours of the die face, resulting in the dieplexer.



DETAILS OF TURBO COMPOUND BARED

The patented technology Wright Turbo Compound engine details the 3,200 hp prototype's more workings, including use of the exhaust gas turbine, top, right. Three of these small turbines are on each

axis. About one-fifth of the engine fuel is lost to be degraded.

•No Design-Term's D. R. Gurnett says with the turbocharging process, which will not degrade exhaust, steel or cast iron materials. A composite and water addition (once cap to a glycerol) is heated to 200°F in a glass or steel container on a hot plate. The dry gas is lowered by steel or cast iron buckets into the solution for two to 10 minutes, water added and rapid.

Convertaways to Test Extruded Rotors

Convertaways, Inc., Annapolis, E. L. N. T. has received a number of solid extruded aluminum rotor blades from Jacobs Aircraft & Engine Co., Potomac, Pa., for installation on a four-rotor helicopter prototype.

Convertaways is developing several new engine design projects, including a system to be powered by turboprop powerplants. The first is now building a small prototype of the four-rotor engine powered by two 30-hp engines. Based on the Wright engine and new Jacobs blade blades through extensive wind-tunnel tests which will prove the feasibility of rotating them at considerably higher velocities than used with current systems. High disk loadings will also be tested during its initial ground tests.

The blades furnished by Jacobs are 7 ft 6 in. long from hub to tip and 37 in. chord. Similar blades of larger chord are being developed by Jacobs for the Air Force.

WHAT'S NEW

New Publications

Letter Symbols for Meteorology is a new American standard to eliminate confusion in the use of these symbols in weather reporting. The new symbols have been approved by the American Standards Assn. The report, designated Y10-1973, may be obtained from the committee at 70 E. 46th St., New York, or the American Society of Mechanical Engineers, 39 W. 57th St., New York.

Tables for Radius and Count Offsets, by Howard Bessie, is planned to permit accurate calculation of the position and velocity of rocket-powered vehicles traveling directly away from or toward the center of the earth. An introduction contains reviews on mechanical, origin of the functions, direct offsets, nearly parallel or "nearly parallel" motion, position and velocity from time, time from position and velocity, orbital and non-orbital motion. The tables and a listing of reference literature.

Telling the Market

Welding and metallurgical aspects of stainless steel—covering austenitic, ferritic and martensitic types—are discussed in Bulletin GKT-953, distributed by General Electric Co., 8600 Broadway, N. Y. 10019.

Larbs open-air training is covered in three 16-mm color sound films. The Meteorology Larbs, Film T-1000 and Climatology Larbs, Film T-1001, are available on loan from Smith Road Larbs Works, 417 E. Madison Ave., South Royal 12, Ind. Running time is approximately 16 min., sound tracks are available in English, French and Spanish.

Are welds strengthening—building up layers of metal as a metal surface is chemically active—see Bulletin GKT-955, distributed by General Electric Co., 8600 Broadway, N. Y. 10019.

Making precise thermal expansions in small lots is described and several representative examples given in 24-page brochure distributed by Devco Rogers Mfg. Co., Monroeville 7, Pa.

Case history of Stinky electric arc-welding equipment used on structural members that broke for Northrup 1040, including welds welding techniques, is detailed in bulletin Reprints/Welding of Weld, Vol. 3, No. 6, available from Stinky Shop, Inc., 615 W. 67th St., Chicago.



LEAD CONDUCTORS—Figure A, lead wire in glass tubing and B in aluminum tubing. In type B or C, close A or B. Thermocouple wire is AWG size 30 to 36 to 38 to 40 (AWG size 30 to 36).

COFFEE-CONCENTRATOR—Figure B, lead wire used with thermocouple in coffee, often in coffee canister, using a metal can. Concentration factor of 10 to 100. Available in AWG size 30 to 36 to 38 to 40 (AWG size 30 to 36).

LEAD-CLAMP—Figure C, lead wire in aluminum and B in aluminum. In type B or C, close A or B. Thermocouple wire is AWG size 30 to 36 to 38 to 40 (AWG size 30 to 36).

While the data are not of value or value of lead wire, specifications.

ACCESSORIES FOR THERMOCUPLE INDICATORS



ANALOG 1



ANALOG 2

TERMINALS FOR THERMOCUPLE LEADS

In accordance with ANSI 100-100, lead wire in aluminum and B in aluminum. In type B or C, close A or B. Thermocouple wire is AWG size 30 to 36 to 38 to 40 (AWG size 30 to 36).

THE LEWIS ENGINEERING CO.
Manufacturers of Graphite Temperature Measuring Systems for Aircraft
NATURAL, CONNECTED

NEW AVIATION PRODUCTS

Many Aviation Uses Seen For Plastic-Treated Cloth

Celohar, an old product with new aviation possibilities was recently put on the market by Calhoun & Henry, Inc. Manufactured by the Celohar Corp., a du Pont subsidiary, the product is a plastic treated fabric, usually canvas. C&H suggests its use for fuselage radars, wing tips and equipment containers.

The material's qualities which make it effective in the aviation industry are its fire resistance, resistance to abrasion, resistance to rot and rust, and its strong adhesive properties.

► **Mold Ready**—It is also elastic, easy to work, and withstands a wide temperature range. The plastic impregnated fabric becomes limp when soaked in a special liquid, called Dunk. In this condition, Celohar can be laid onto any shape of mold and will then hold its form after a setting period of about 70 days.

The mold is an last coated with a priming agent to prevent Celohar from adhering. After 24 hours, the material turns and bakes in an extremely tough but not brittle shape.

When cured, Celohar becomes very hard and resists swelling and abrasion very well, the company says. This would make it suitable for floor covering of cargo aircraft and covering for passenger plane exterior wing and galley.

Distributors of Celohar are the material is completely immune to rot and is absolutely waterproof. Salt water has no effect on it. Applications indicated include air tank waterproofing and sea plane use.

► **Stick Tight**—Celohar is used to adhere its ribs with intensity to avoid known effects that removing it is extremely time-consuming after the plastic has hardened. Coated surface should be free of oil, loose paint or rust.

Under actual service conditions, Celohar has withstood temperatures of -60F to +140F. In the laboratory it has tested temperatures of -110F to +212F for several hundred hours according to C&H. The material dries rapidly about 100F.

Celohar's elasticity after curing makes it highly resistant to vibration, fatigue and shock. It may be worked with ordinary wood working tools. It can be drilled to any degree of penetration and tapered for machine screws but it will not hold a wood screw. It may be painted as desired.

When treated with suitable Glue applied by C&H, it can be bonded to

the same manner as any standard metal in this application, it can be used to fill in fuselage or wing dents quickly and easily without need of riveted patches.

Celohar, which has been used in heavy industry in an adhesive and protective covering for 27 years, comes in a large variety of weights and thicknesses, depending on the application for which it is selected.

Although Celohar and Dunk are not flammable during application, after the Dunk has evaporated, Celohar is "slow burning," according to Underwriters Laboratories, Glendale, Calif.

Calhoun & Henry, 551 Fifth Ave., New York 17, N. Y.



Coupling Disconnects Under Full Pressure

E. H. Wiggins Oil Tool Co. is now letting a hydraulic coupling that can be disconnected under full system pressure by pulling and releasing with a push pull.

Another model disconnects automatic tools at any desired load weight or system pressure.

Where pressure drop is the primary concern, large couplings are used on small tube lines. An example: 2 in. fittings can be coupled to 4 in., taking 1/2 in. of the main flow, underline couplings can be used, according to Wiggins.

The company claims its units, called fast-e-matics, are lighter than comparable couplings.

The couplings eliminate the need of shutting off the hydraulic system in an emergency to make repairs, Wiggins says. They are fast-act, always closed when disconnected, open when coupled,

and can be substituted for ANSI-B1 and ANSI-B2 standard couplings without changing working pressure.

E. H. Wiggins Oil Tool Co., 1424 E. Olympic Blvd., Los Angeles 25

ALSO ON THE MARKET

Aluminum safety shoes for straight and extension ladders can be fitted with either rubber treads or spikes. They are non-slip and are suitable to all most any metal or wooden ladder, says maker. Price: \$4.50 per pair—Aluminum Ladder Co., Warrenton, Or.

Engineered version of widely used IMU Micro precision limit switch, called the type assembly, has been approved by Underwriters for use in hazardous atmospheres, Class I, Groups C and D—Meco Inc., Minneapolis. Minneapolis Regulator Co., Portland, Or.

Measuring with accuracy of 0.2 microns, the balanced, gaged movement of the constant speed vision. Non-inducting type, it gives accurate control of temperature or actuates alarm when used with standard thermocouples. Response time range from 1 millisecond to 10 sec.—Assembly Products, Inc., Mass. at Bell St., Chgo. Park, Ill.

Fasten strap for various components is highly resistant, corrosion resistant and has trouble properties comparable to cold-chambered steel. It is available in this strap or flat, in 1/8 in. widths and thicknesses down to .0005 in. in increments of .0001 in.—American Safety Co., Inc., 1647 Prince St., Flushing, N. Y.



3-D IN INDUSTRY

3-D has its place in industry as well as in the home. This ingenious young boy is supporting a boy ball league with a miniature football stadium, the Magni-Power. That's right to hand, leaving him to do it. It is made by Elio Products Co., 400 Lexington Ave., New York 17.



AMERICA'S AIRCRAFT GUARD THE PEACE WITH PASTUSHIN TANKS

Added range for our combat planes means striking deeper behind enemy lines — hitting where it hurts. Pastushin pistonable fuel tanks, lighter, stronger — the product of long and specialized experience — give our military planes added efficiency in combat or in patrolling America's Air Frontier.

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Parts built by Associated have the stamp of some of the most expert engineering, testing, fabrication and quality control in the world. Assembly is a part of our symbol of dependability in use. First metal fabrication, components—designing, tooling and production—can be used in industry by Associated. Write:

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WICHITA, KANSAS

FINANCIAL

Projected Results Aircraft Manufacturing Companies

Manufacturer	1953 Actual			1954 Estimate			1954 Estimate		
	Total Sales (\$Mill.)	Per Ship	Per Ship (\$Mill.)	Total Sales (\$Mill.)	Per Ship	Per Ship (\$Mill.)	Total Sales (\$Mill.)	Per Ship	Per Ship (\$Mill.)
Boeing	205.4	2.27	90.5	210.0	2.30	91.3	215.0	2.33	92.7
Boeing	270.0	3.07	87.8	275.0	3.07	90.0	280.0	3.07	93.3
Curtis-Wright	101.7	1.10	92.5	105.0	1.10	95.5	110.0	1.10	100.0
DeSoto	120.0	1.30	92.3	125.0	1.30	95.4	130.0	1.30	100.0
Eastman	140.0	1.50	93.3	145.0	1.50	96.7	150.0	1.50	100.0
Grumman	130.0	1.40	93.0	135.0	1.40	96.4	140.0	1.40	100.0
Lockheed	400.0	4.00	100.0	410.0	4.10	102.4	420.0	4.20	104.8
North	140.0	1.50	93.3	145.0	1.50	96.7	150.0	1.50	100.0
North American	130.0	1.40	93.0	135.0	1.40	96.4	140.0	1.40	100.0
Republic	140.0	1.50	93.3	145.0	1.50	96.7	150.0	1.50	100.0
United	100.0	1.00	100.0	105.0	1.05	104.8	110.0	1.10	109.1

Airline Companies

Airline	1953 Actual			1954 Estimate			1954 Estimate		
	Total Sales (\$Mill.)	Per Ship	Per Ship (\$Mill.)	Total Sales (\$Mill.)	Per Ship	Per Ship (\$Mill.)	Total Sales (\$Mill.)	Per Ship	Per Ship (\$Mill.)
American	40.0	0.40	100.0	41.0	0.41	102.4	42.0	0.42	104.8
Boeing	10.0	0.10	100.0	10.5	0.105	104.8	11.0	0.11	109.1
Boeing	10.0	0.10	100.0	10.5	0.105	104.8	11.0	0.11	109.1
Eastern	100.0	1.00	100.0	105.0	1.05	104.8	110.0	1.10	109.1
Northwest	10.0	0.10	100.0	10.5	0.105	104.8	11.0	0.11	109.1
Southwest	10.0	0.10	100.0	10.5	0.105	104.8	11.0	0.11	109.1
TWA	100.0	1.00	100.0	105.0	1.05	104.8	110.0	1.10	109.1
United	10.0	0.10	100.0	10.5	0.105	104.8	11.0	0.11	109.1

Source: The Value Line Investment Survey

Survey Sees Airline Earnings Dip

Value Line expects carriers to feel 1954 profit squeeze, but finds longer-term outlook for aviation bright.

An optimistic view of aviation's future is expressed by Value Line, the investment survey, in its annual issue. The bright outlook is tempered somewhat by an expected dip in 1954 air line profits, but the long-term prospect for both air transport and aviation manufacturing is considered good.

Aircraft Builders—The aircraft builders, "with inflated orders for two or three years ahead of them may be one of the few bright spots in the otherwise gloomy year," says the investment survey.

"Despite the decline in business activity which we envisage within the

and 12 months," Value Line states "these companies will be producing at peak rates, increasing peak earnings, and paying peak dividends."

Transport Dip in 1954—While the long-term prospects of the air transport industry are considered "bright" by Value Line, it anticipates an earnings decline in 1954 for the group. This is largely centered on the survey's projection of a 5% decline in the gross national product next year compared with an 8 to 10% drop in the Federal Reserve Board index of production.

"Such an economic environment would be less favorable for the airline companies than the boom economy in which they have operated so far this year," the service says. "Yet the airline growth recorded in air traffic during the past decade has been so strong that it can be expected to counterbalance the weight of a lower national income next year, just as it did in 1949."

In more specific terms, while wide revenue passenger mileage gains are anticipated for 1954, Value Line looks for dollar revenue gains of 5 to 6% compared to estimated volume gains of 12 to 15% this year. With unit volume increasing more than dollar volume, operating costs will rise faster than revenue, causing a profit margin squeeze and a moderate decline in operating profits. Record depreciation charges will magnify the dip in operating profits, causing estimated net income declines of as much as 35% in some cases.

Looking Ahead—Individual aviation companies are also reviewed by the investment service with projections advanced for earnings anticipated in 1953 and 1954-a comparison underlying.

The forecast for 12 aircraft builders for these two years in terms of total sales, per share earnings and dividends is included in the accompanying table. For comparison purposes, similar 1952 results in the same categories also are tabulated.

In a similar vein, projections are advanced for eight airlines by Value Line. These forecasts also are presented in the table.

The forecasts developed by the investment service represent an interesting indication of future trends in the aviation group. It must be recognized, however, that neither aircraft manufacturing nor air transportation are static, and completely unexpected events can and do frequently change the course of the individual companies. (The opinions expressed are those of Value Line advisory service and not necessarily those of the undersigned or Aviation Week.)

—Selig Altschul



It's a fact, too—

Shell Aviation fuel carries the most passengers . . . the most air freight . . . the most air mail in the United States today.

*SHELL AIR FACTS

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SILASTIC

works where other materials fail!

After certain jet engines were put into service, it became apparent that the could build up on the air scoop fast enough to cause engine failure. Jet designers knew that this could be alleviated by giving all jet engines a compressor built up to the scoop. There were many problems however. The engines fit in tightly in their nacelles that there was little room left, and high frequency vibration is likely to cause fatigue failure. Engineers of the Aeroquip Corporation of Jackson, Michigan solved the problem with flexible Silastic tubing reinforced with stainless steel braid. The braid tubing is mechanically held in tightly to the nacelle and knowing that the tube will not collapse even when subjected to a vacuum. The new Aeroquip "Turbo Quip" tubing solved the high temperature problem of silencing a firing in the line.

So effectively was the job done that these and other lines have become standard equipment. The Silastic lines are light, unaffected by vibration, and easily assembled and disassembled. Double banded and ex-

tended to operate as high as 500°F, the Silastic lines are still in excellent condition after hundreds of hours of service. Aeroquip has supplied thousands of them to jet manufacturers from 5 to 25 are required per engine, depending upon its design.

Test load of performance is evidenced by testing rig data supplied by our Silastic laboratories (see Figure 1). Heat resistant organic rubber becomes brittle in a few hours. Silastic does not crack on flexing 360° over a 1/4 inch radius and handles sustained over 25 pounds from 84 to 77 after 7 weeks, or 27 1/2 hours of continuous flexing with all surfaces of the test sample exposed to an air circulating over at 400°F. Not only engineers who need reliable properties at temperatures ranging from -100 to +500°F specify Silastic.

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A MESSAGE TO AMERICAN INDUSTRY • ONE OF A SERIES

BRITONS CAN HAVE PROSPERITY —If They Want It

What is required to get Britain, our key ally in the grand alliance of the free world, firmly back on her economic feet? The purpose of this message is to throw light on this crucial problem, which afflicts our other European allies also.

At the moment, Britain is enjoying a respite from the economic crisis (of 1947, 1948 and 1951-52) which have plagued her post-war course. This respite may well continue for some time. But almost no one whose judgment is trustworthy believes that Britain has acquired sufficient economic strength to safeguard her against further economic crises in the years immediately ahead.

Two British Views

New and clear light on what should be done to that end has recently been shed by two noteworthy British publications. One is a book, "We Too Can Prosper," by Graham Hutton, distinguished British economic writer and administrator. The other is an article, "The Riddle of Prosperity," published by THE (London) ECONOMIST, Europe's most eminent economic journal.

Combined, these two publications present

in sharp relief the basic problem that must be handled successfully if Britain is to be made solvent. As is implied by its title, the Hutton book demonstrates that Britain can be made prosperous by readily feasible procedures, patterned on what has been done in the United States, to increase its industrial efficiency. But, says THE ECONOMIST, with Mr. Hutton's book in mind, this is not the most basic problem, which is, "How shall we make the British people determined to be prosperous?" This is a problem of incentive or motivation.

Compared with that of the United States, average industrial efficiency in Britain, as in most of Western Europe, is low. In his book Mr. Hutton remarks that "fifty years ago as American industrial worker turned out roughly the same amount in a day as his opposite number in Britain, Germany or France . . . Today, he turns out from two to five times as much."

In large part it is this lag in output per hour or "productivity," on the technicians' cuff it, which makes Britain and other key countries in Western Europe a continuing prey to economic crises. Moreover, the great disparity in productivity between the U.S.A. and most

of Western Europe is a major barrier to knitting the free world into a smoothly working economic whole. As one observer put it, "when the American economy catches a cold, the European economy gets pneumonia." This is largely because Europe is so much weaker in productive strength.

No Shortage of Knowledge

Yet the knowledge which would enable the countries of Western Europe, and particularly Britain, to increase their industrial productivity has been mobilized and is readily available to them. It is with this process for Britain that Mr. Hutton's book is concerned. In the book he summarizes the findings and conclusions, virtually all of them unanimous, of 68 teams, composed of British industrial managers, technicians, shop workers and labor leaders. Over a period of three years these teams completed a comprehensive series of inspection and study trips in the United States under the sponsorship of the Anglo-American Council on Productivity. The product of that effort, he remarks, is "a set of documents the like of which, on such a scale and of such practical value, has never been seen in the history of international and cultural borrowing."

Psychology the Key

From study of these documents, Mr. Hutton concludes that better capital equipment is the key technical ingredient of higher industrial productivity in Britain, and constitutes "the most urgent . . . need of British industry." But he finds that even without new capital equipment a "45% rise in productivity can still be achieved by reorganization of work," and that such an increase would "solve Britain's chief social and economic problems."

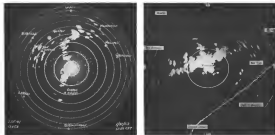
Then why is not such an increase in productivity, demonstrated by the Anglo-American

productivity teams to be so clearly within technical grasp, promptly forthcoming? Mr. Hutton, quoting one of the team reports, remarks that, "The greatest obstacles to increased productivity are psychological rather than technical." We have to deal first and foremost with men, not machines." And THE ECONOMIST, pursuing the line of inquiry suggested, reaches the conclusion that, by and large, the people of Britain do not want to prosper by being more efficient. THE ECONOMIST says:

"The real secret of American productivity is that American society is infused through and through with the desirability, the rightness, the morality of production. . . . But in Britain, if any moral feeling at all survives about economic matters, it is usually a vague suspicion that economic success is reprehensible and unworthy. From this difference in attitudes everything else follows."

"Now," asks THE ECONOMIST, "should we set about restoring some belief in the rightness of effort, the morality of success?" For this question it has no ready answer. Neither have we. We are confident that the British people will neither be cajoled nor coerced into trying to match our productivity. Basically the problem seems to be to demonstrate clearly to them the truth of the proposition, set down by Graham Hutton, that "there is no goal, aim or end before a Good Society which the raising of that society's material productivity cannot render easier of achievement." Doing that in an old and settled country like Britain is obviously an extremely formidable undertaking. But until it is done, the crucial job of getting Britain and the rest of Western Europe lively as its economic feet will remain to torment all of us.

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STORM TRACKING RADAR covers 120,000 sq. mi.

RADAR points detecting planes around storm center.

New Avionics Gear Aids Airline Reliability

- Improved equipment and procedures installed at U. S. airports cut cancellations to 4% of scheduled flights.
- But mechanical failures in aircraft and lack of spares may set back carriers' high rate of completed trips.

By Lee Manno

New all-weather flight equipment and procedures now coming into general use are moving toward a long step away that ultimate goal of perfect schedule reliability.

Complete effect of the equipment this year probably will put the U.S. a solid 1% closer to total mastery of the air in commerce, as well as war.

Airlines completed 95% of their scheduled flights last winter, compared with 95% the year before. Bad weather and mechanical failures canceled 4% of scheduled flights.

Comparing that last 4% may be as impossible as that a 1% gain is one year as a great credit, although it is day-to-day achievement is undeniable.

• **Mechanical Problems**—Despite rapid improvement in all-weather operations, other problems actually may set schedule reliability back, for a time, according to Miles Arnold, Air Transport Association president-engineering and operations.

He cites situation of facilities be-

cause of the boom in air travel both in volume and geographic spread. Scheduled airport delays have increased more than one third since 1950.

When airlines land during air high, mechanical failures cause cancellations that would be impossible if perfect schedule reliability were achieved, as they are when business is not so good. An example of this was the winter of 1951-52 when schedule completion averaged less than 90%.

• **Beating the Weather**—This year's crop of improvements in all-weather operations include complete radar traffic control, stereo-free navigation and communications network throughout the country, radio-aid "weather advisory service", standardized approach, runway and taxiway marking, tarpaper (less than 500,000 square approach areas) (TWIC) start visibility airport number reporting, and down, long-range traffic control communications.

Here is a preview report on implementation of some of the most important:

• **Radar traffic control**, in various stages

of implementation, is now the instrument-weather control system at Washington, Chicago, New York and several other busy areas. Fully automatic Washington National Airport starts each new step in the implementation program toward total radar control.

Next step: increase the radar control limit to include all operations when visibility is less than five miles (one nautical mile) and establish an 180-mph. speed limit on all planes within a 15-mile radius.

Civil Aeronautics Administration study reports the following improved results in Washington National Airport capacity during instrument conditions. Before the radar program, total instrument-approach delay time during November 1951 was 32 hr. 5 min. with 681 instrument approaches, or 94 hr. per approach. The most comparable month this year was January, with total delay reported at 2 hr. 40 min. or 1,519 approaches, or 60 hr. per approach. Capacity under section in conditions increased from 184-216 arrivals on typical days in 1951 to 246-315 arrivals in 1952.

Airport surveillance radar formerly was used primarily as a monitor, in addition to the conventional system of showing planes on posts and "beeping" them in on the basis of the so-called instrument landing system equipment.

Radar traffic control implementation

PAA Division Wins \$11.3-Million Subsidy

Civil Aeronautics Board has granted a final subsidy of \$11,300,000 a year for Pan American World Airways' Latin American Division effective from Jan. 1, 1971.

The Board estimates the PAA division should cost \$3.5 million annually after taxes with this rate.

Total proposed end pay of \$11,371,800 is made up of the subsidy plus an estimated \$1,871,000 straight-out compensation for end salary at 59 cents a ton mile.

The \$13 million total is \$3 million more than CAA gave Pan American in 1971. (The 1972 rate is not yet settled.)

In its opinion and three-volume order, the Board cites three major reasons for the big increase since 1971:

- Nonoperating income of LAD in 1971 was \$4,777,000 more than this unit would for typical future year.
- Return on investment extended for the future period is higher because CAA permits a 10% return for a future period, compared with 7% for the (higher) post investment loss but increased because of company growth.
- Income tax estimated for the future year is \$1,111,000 more annually than the 1971 payment was.
- "Nonrecognition," the Board adds, "is concerned by the high level of subsidy still required for the carrier's Latin American operations."
- Significant CAA-CAA recently set Pan American's 1971 subsidy, disallowing a substantial amount of expenses and investment. The company has not acted "conscientiously" to reduce the subsidies that the Board considered cost-efficient operation.

CAA's projection on the future rate notes several "significant changes" from the 1971 operation:

- DC-8s replaced B-777s on service to Buenos Aires, "without apparent loss of traffic and with increased load factors."
- DC-6s replaced C-46s on all cargo operations.
- Ticket service increased to San Juan, P.R.
- Other Latin American routes now use no more modern equipment than the DC-4.

• **Schedule-Late Route:** The Board has decided to end subsidy to PAA's New York-San Juan service, effective last Jan. 1. It is a high-density, long-range route that yields a profit without subsidy, CAA says.

• **Schedule-Late Route:** The Board has decided to end subsidy to PAA's New York-San Juan service, effective last Jan. 1. It is a high-density, long-range route that yields a profit without subsidy, CAA says.

• **\$4-Million Cost-PAA** told the Board it probably would cost \$9.5 million a year to break even. CAA cut this to \$3.5 million.

- **Profitable major adjustments:**
- **More commercial revenues:** \$915,000
- **Lower depreciation and amortization:** as 1-44. CAA's latest
- **Other depreciation and residual value adjustments:** \$700,000
- **Limit of selling expense:** to 1% of total commercial sales, \$745,000 a dollar.
- **Limit of administrative expenses:** to 12% of total revenues (including San Juan service), a \$70,000 cut.
- **Pilot fuel allowance:** \$1,213,000 cut. Pan American pays pilots for flying duty by through cargo on PAA's Miami-San Juan route. CAA said it "does not find warranted a double payment of flight personnel salaries in subsidy rates."

Honolulu-Tahiti Line Wins CAB Certificate

Civil Aeronautics Board has certified the route, Pacific Air Lines for Honolulu-Tahiti service, tentatively scheduled to start by the end of this year (AVIATION WEEK, July 6, p. 33).

The Board issued the certificate to two years, subject to renewal. SPAL earlier requested an annual subsidy.

On the West Coast, meanwhile, the carrier's president says Civil Aeronautics Administration has not voted SPAL's plans to use Short-Split flying boats on the new route.

First report that the plane would not be used came from Richard K. Kimball, a director of Pacific Airline. He said CAA ruled the flying boat could not be used for the entire line unless new and

new two of older planes were installed or the load limit reduced. Kimball said the plane was to fly by DC-4 or DC-6 from Hawaii to New York and complete the run with a Short.

But M. S. van Buren, South Pacific president, declares: "The CAA has positively made no ruling regarding the Short. We are not so much at the present time, why the Honolulu-Tahiti service will not be inaugurated as planned."

The Board's long list is an attempt that is completely unknown to Civil Aeronautics Administration and, as such, must be studied by them before licensing can be accomplished. "We were well aware of this fact when we completed purchase of the boat."

Venezuela Signs Air Route Pact With U.S.

(McGraw-Hill World News)

Caracas, Venezuela: The Venezuelan government signed its first bilateral air transport treaty with the United States this month after nearly three years of negotiations.

The international air routes mutually controlled those for Venezuelan lines to America, five for U.S. lines to Venezuela. Each government may name the aircraft to provide its service.

The compact outlines effective a separate agreement signed Aug. 7 between the Venezuelan government and Pan American World Airways.

The treaty sets up the following routes for U.S. air service to Venezuela: Eastern route of the U.S. via Puerto Rico, the Dutch Antilles, Caracas, Brazil and beyond; Eastern route of the U.S. via Cuba, New York, via Cuba, Brazil, Dominican Republic and Dutch Antilles to Caracas; Eastern route of the U.S., except New York, via Cuba, Jamaica and Colombia to Maracaibo; Central route of the U.S. via Cuba, Jamaica and Dutch Antilles to Caracas; Canal zone via Colombia to Maracaibo and Caracas; Trinidad and beyond.

Venezuelan service in the U.S. involves these routes: Venezuela, except Maracaibo, via Dutch Antilles, Dominican Republic and Cuba to New York and into Canada and beyond; Venezuela via the Dutch Antilles and Jamaica to Miami, Venezuela via Havana to New Orleans.

TAL Asks Honolulu Route Without Subsidy

Tennessee Airlines petitioned Civil Aeronautics Board for a new service to Hawaii and three outlying islands asked to keep their West Coast-Hawaii

line flights in nonexclusive hearings now completed.

Here are their positions:

- **Seattle, Portland:** Northwest Orient Airlines and Pan American World Airways agreed their two carrier from Portland and Seattle to Honolulu are not too busy to earn money for either carrier, but each and the other should get out.

- **Los Angeles:** United Air Lines asked removal of its Los Angeles-Honolulu route. Pan American did not oppose it. (PAA holds permanent rights in San Francisco and Los Angeles, UAL in San Francisco only.)

- **Oakland, San Angeles:** Nonstop Pacific airtourism airlines asked rights to give non-stop passengers and improve service from Los Angeles and Oakland to Honolulu. Pan American and United opposed this.

- **United DC-9s:** Plans-United Bay Island and the company would replace Lockheed Boeing Stratoformer service to Hawaii with Douglas DC-7s and would increase DC-9s service to Seattle in September. He declared the Stratoformer as valuable in heavy situations but is uneconomical.

United and PAA's Stratoformer competition to Hawaii induced United to buy the plane originally. He did not indicate what UAL would do with its Boeing transports when DC-7s replace them.

SHORTLINES

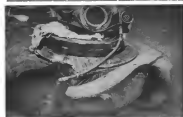
- **Acres Portugal:** one of Portugal's three civil airlines, has closed operations, its location has been transferred to Transporeta Aerea Portuguesa (TAP). That leaves Portugal with TAP, an international airline, and SATA, which provides air service to the Azores.

- **As France attempt of takeover:** Venezuelan has been delayed, partly by a late decision to substitute some American-built equipment. • **Company has three:** Lockheed for Comet 2s in order for delivery early in 1975.

- **Allegory:** Airlines president Leslie Barnes says the company will reduce subsidy requirements steadily while increasing earnings. Company made \$21,169 in 1968 (total loss \$3) with last subsidy that fiscal 1972, when it lost \$142,037. Policy changes under the new president include locating offices in the town center, aggressive advertising, joint office with Midwest Airlines at Newark.

- **British Overseas Airways:** starts London-Brussels service twice a week in October, competing with U.S. carriers.

Comet Lands at Wrong Airport



Two top pilots there what happened to a BOMC Comet that landed by mistake at small John Airport near Boulder on July 16. This time was pilot not to blame the landing run in the short field. Aeronautics top pilots indicate how pilots were worse while carrying ground. Refuse pilots there place, after being fitted with new wheels prior to takeoff. The pilot had been instructed to land at nearby Sarno

One international airport on a runway nearly parallel to the one he landed down on at John. He realized he was in error as he landed 500 ft from the end at the 1,600-ft-long and applied full brakes. The jet brought itself to a stop in 160 yd and burst off right time of its main gear. The landing gear broke without the heavy loads. After being fitted with new tires, plane took off lightly loaded in 600 yd.

Americans Patronize Progress

There's a lesson for commercial aviation in the astounding public use of the New Jersey turnpike. Auto traffic in the first six months of this year exceeded the volume that "experts" had forecast for 1971. That's on a toll road, mind you, with all competing roads free.

American like to travel when it's easy, quick, safe and economical. They will change their habits overnight to get something better.

All of the laborious statistics you can dig up out of the past sometimes add up to positively nothing but a detriment to progress when it comes to forecasting whether some new services will or won't pay off.

That is why the Civil Aeronautics Board has been so wrong in refusing to encourage new air services for experimental short-term periods. They dropped their first on confounding cargo lines. They delayed the helicopter. They sent to kill off the unscheduled passenger line, even though the certificated carriers still are not meeting the transcontinental demands.

America is dynamic and growing. So is aviation. Those who try to stifle the growth of urban air are doomed to failure ultimately. Unfortunately, they are able to succeed for a while—until the pressure for growth precipitates an explosion. We are approaching one of these explosions on the unscheduled air carrier situation, for example.

We are betting on those who are willing to take chances betting on aviation—and the nation's—growth.

The Sabre—A Great Ship

Like a a tribute to the Sabre, a remarkable fighter. The Korean combat record of North American's term the McG-killings F-86 jet is well known. Less publicized is the fact that it has obtained a standardized international status that is probably unmatched in aviation history.

Recent first flight of Australia's first F-86 from a field near Melbourne puts the winged Sabre into the armament of another of the British Commonwealth countries, along with the Canadian-built Sabres which are becoming an important backbone for the British RAF as well as the Canadian RCAF.

North America also has a licensing agreement with the Italian Fiat Company for production of the F-86 airplanes in Italy.

Besides the three licensed foreign versions, North American itself is building several versions of the basic airplane at its two plants in California and Ohio, both for the U. S. Air Force and the U. S. Navy. Current plans in production are the F-86D, F-86F, and F-86H for the Air Force and the FJ2 and FJ3 for the Navy. In pre-production stages is a super Sabre, the F-100, which will carry on the line.

To get Commonwealth Aircraft of Australia into production lines, North American provided 100 complete sets of airplane parts along with tips and toolings. As a result, the initial flight of the first Aussie Sabre

was made in less than a year from the start of production. Canadian, Ltd., first licensee, has been producing Sabres since 1949.

It is no wonder that the Sabre is popular. It has had a monopoly on the world's official speed record since 1947, with first different Sabre models sharing in the laurels: the F-86A, F-86E, F-86D and the Canadian-built Canada-powered F-86C.

But East Air Force's dominance on the combat record of the F-86 in the Korean built MIG-15, in Korea, showed 835 MIGs destroyed, as compared to 83 U. S. jets lost in air-to-air combat.

A revised Fifth Air Command tally credited the F-86 with 300 MIG-15 kills in Korea, while only 58 of the Fifth's Sabres were lost in air combat.

These statistics demonstrate that the Sabres earned the brunt of the mid-line air-to-air combat for the U. N. in Korea.

During the latter part of the Korean conflict, F-86F fighter bombers, which could be used also for air support or other they dropped their bomb loads, scored heavily in interdiction work.

After several years of positive experimentation with other jet carrier fighter types, U. S. Navy turned to the basic combat proven Sabre F-86 airframe which, with only minor changes, has now become the FJ3 carrier fighter.

Many of us in aviation are ready to label the Sabre the No. 1 airplane of the free world for air superiority control.

Stand By for Treachery

There's a treach in Korea, but let's keep our powder dry.

A trickle of press reports on the news wires do nothing to raise our alarms for the word of the Commonwealth Radio showed a flurry of aerial activity over the Yalu, almost as the truce was signed. The planes were not ours. Communist troops were reported streaming into North Korea from Manchuria. Now, the Communists were revealed by colored airplanes to have tried and ventured many of our G. I.'s to imprisonment just before the fighting ended, on trumped-up charges.

American War, Aug. 10 pointed out that the truce terms were bitterly disappointing to our Air Force. The Communists are allowed to build up North Korea airfields. Our air forces, meanwhile, are officially prohibited from carrying on aerial reconnaissance of North Korea. "Air Force positions in Korea, none too secure at best, that will be cross means of fighting is removed," this sanguine staff, cautioning Air Force officers.

Treacher is standard operating procedure for the Communist brigades. We should hold ourselves ready for more of it, and the next time if these international bandits ask for it—we should give them everything we have. That would be a contrast to the "war" of the past three years, wouldn't it?

—Robert H. Wood

1912 Lawrence
Sperry and
the first Sperry
gyroscopic
autopilot. In 1914,
Sperry won second
prize at the French
War Department for
the first "stable at-
titude."



AUTOMATIC FLIGHT...

another Sperry first... 1912



1933 Willy Post in the Wrenie II made first solo flight, round the world flight. Using the Sperry Automatic Pilot, Post was able to nap while plane, under automatic control, flew itself.

SPERRY GYROSCOPE COMPANY
DIVISION OF THE SPERRY CORPORATION
GREAT NECK, NEW YORK



From the day in June, 1914 when Lawrence Sperry won the French War Department a \$10,000 prize for the first "stable airplane," Sperry has taken the lead in making flying more and more automatic... in flying itself has required more and more precision. From the first simple stabilizer have come development after development such as the Sperry Automatic Pilot and Automatic Approach Control to guide planes in better landings under all weather conditions.

TODAY, AS ALWAYS,
SPERRY LEADS THE WAY

In production today at Sperry are instruments that give man even greater mastery of the elements. And the military demand is so great that hundreds of subcontractors are now sharing with Sperry the important task of meeting these requirements.



1953 USAF's B-47B is equipped with Sperry Gyrodome, combining the best of gyroscopes, servos, and signal systems technology.



1977 Sperry instruments are busy today solving automatic control problems for ships and missiles of the future to control them with precision.

Where can you use this simple fastener?



Rollpin is driven into holes drilled to normal production-line tolerances.

No threading, peening or precision drilling with **ROLLPIN**



It compresses as driven.



Rollpin fits flush . . . is vibration-proof.

Rollpin is the slotted tubular steel pin with chamfered ends that is cutting production and maintenance costs in every class of industry.

This modern fastener drives easily into standard holes, compressing as driven. Its spring action locks it in place—regardless of impact loading, stress reversals or severe vibration. Rollpin is readily removable and can be re-used in the same hole.

* * *

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Please send me the following free fastening information:

☐ Rollpin bulletin

☐ Here is a drawing of our product. What fastener would you suggest?

☐ Elastic Stop Nut bulletin

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Firm _____

Street _____

City _____ Zone _____ State _____